

# PENETROGRAPH

The penetration resistance of the ground can be determined in the field, using a penetrometer. One of the range of penetrometers is the mechanical recording penetrometer.

## The penetration resistance

The penetration resistance is a means of determining the ground load-bearing capacity, and the ease with which roots will grow through the ground.

Determining the load-bearing capacity is of the greatest importance in the design of foundations for civil engineering works (building work, laying runways, the design of dikes and roads, etc.).

There is also a requirement for quantitative measurements of the ground profile, for agricultural and cultivation purposes, in connection with all aspects of land utilisation (ease of root penetration plays an important role in the provision of planted public areas).

## 06.02 Penetrograph

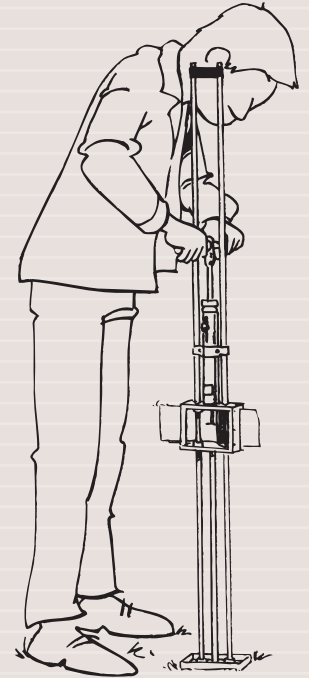
The penetrograph is a device for determination of the penetration resistance of the ground. The standard set is equipped with various penetration cones, recorder pens, probe rods and recording charts. The entire set, including spare parts, instructions, cone check and the tool are packed in an aluminium carrying/transport case. Every penetrograph is supplied with a quality test report. The penetrograph measuring range is up to 5000 kN/m<sup>2</sup> (= 5 MPa) and is suitable for measurements at depths up to 0.80 m.

Continuous measurements can be made with the penetrograph, recording each layer of the ground profile up to 0.80 m on the chart.

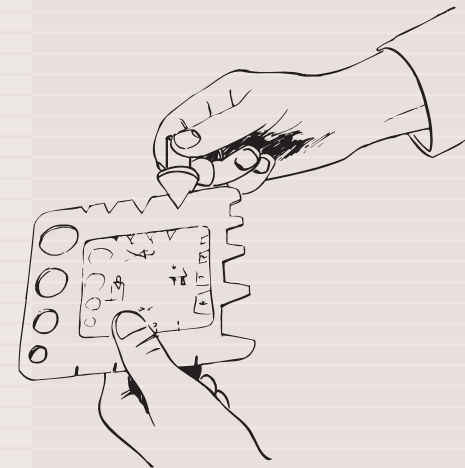


**P1.51**  
Parts List  
Pg 327

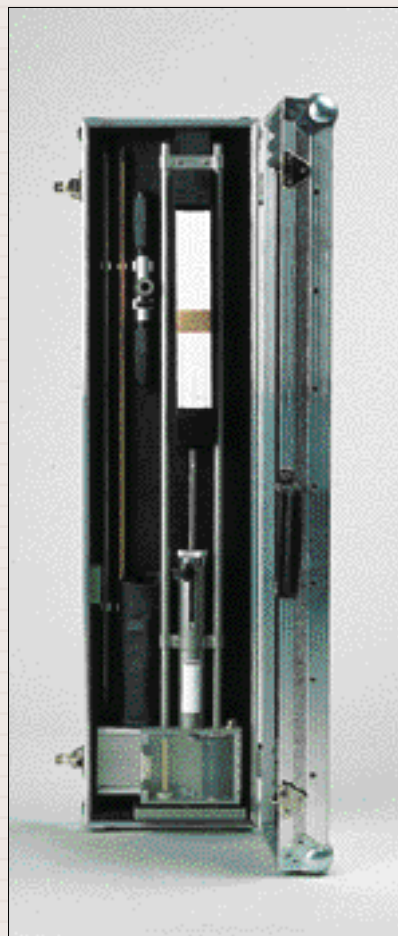
**While measuring the penetration resistance of the soil, the probe-cone is pressed vertically into the ground.**



**The cone check is used to inspect the wear of the cones.**



Penetrograph



Penetrograph, standard set



**P1.51**  
Parts List  
Pg 327



# PENETROGRAPH

In addition, the penetrometer is self-recording, i.e. during the measurement the resistance is immediately graphically recorded. This greatly reduces the amount of work to be done afterwards, the data can be immediately transferred and it is easy to store.

The principle of the measurement is based on the compression of a calibrated spring, while at the same time the chart is moved in proportion to the depth by the drive pulley. To check if the penetration into the ground by the probe rod and cone is vertical, the penetrometer is fitted with a bascule spirit-level.

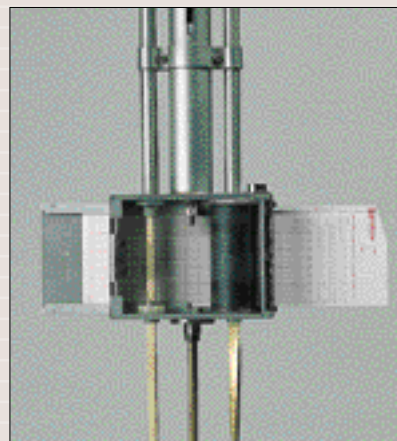
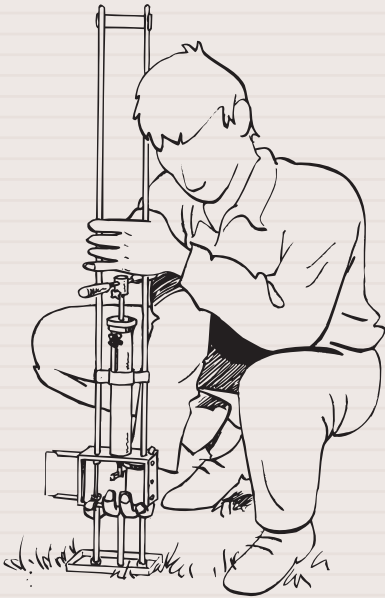
The penetration should be as close as possible to the vertical, to keep the pressure and friction on the probe rod to the lowest possible levels.

## Applications

The penetrometer is used for:

- general soil science examinations (e.g. for profile descriptions, obtaining data for evaluating the suitability of soils).
- checking the suitability of soils for carrying vehicles or pedestrians.
- checking artificially-made compactions (e.g. sand-filled trenches).
- checking load-bearing capacity for the installation of underground tanks.
- the detection of compacted (possibly impenetrable) sub-soil layers (e.g. layers compacted below ploughed depth).
- research into poor growing conditions, including those for trees in urban streets and parks.
- research into the connection between the intensity of rooting of specific crops and the resistance to penetration of the soil layers present.

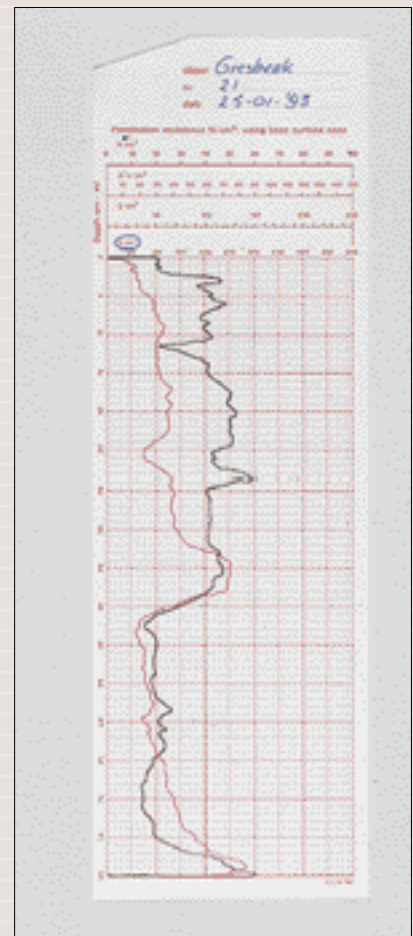
**The penetrometer may never be with-drawn from the ground on the guide rods. When withdrawing it, the hand is held below the recorder case.**



Recording instrument



Cones



Recording chart